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Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

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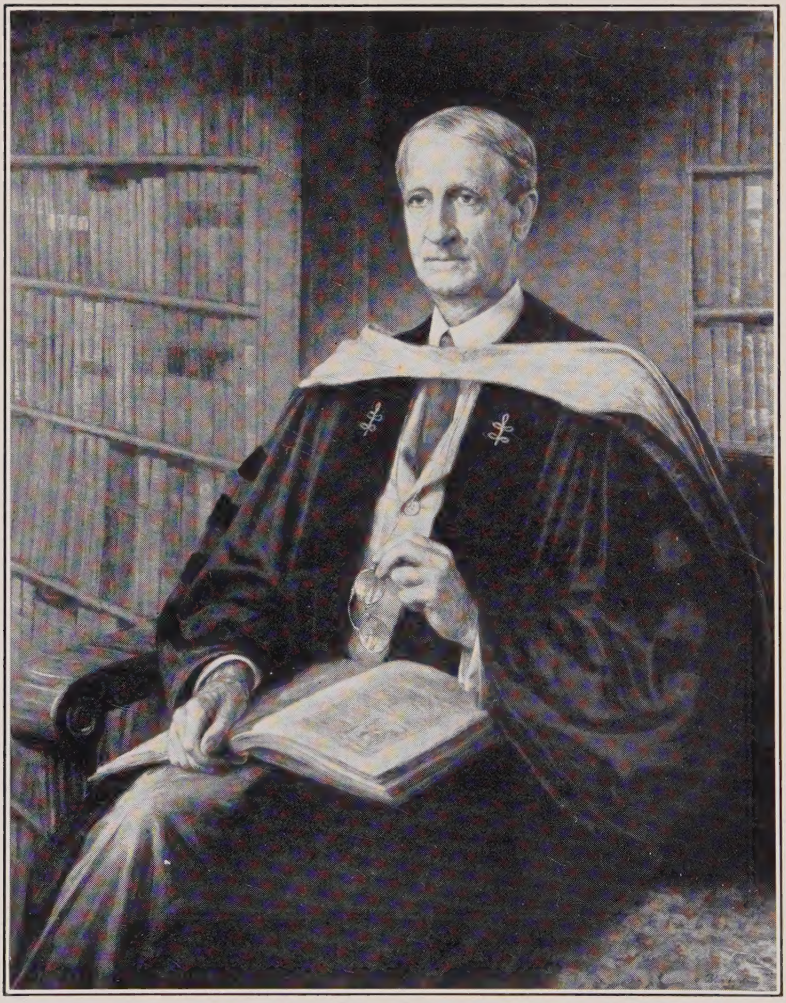

From a painting by Blanche Ames, 1946

OAKES AMES

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 53 March, 1951 No. 627

OAKES AMES, 1874–1950

Richard Evans Schultes[1]

(With portrait)

Taxonomic botany has become a great science mainly through the efforts and consecration of outstanding builders—men who, with respectful trust in the past and hopeful faith in the future, have studied and amassed material on which scientific progress can be made.

We have recently lost one of the great builders in taxonomic botany. On April 28, 1950, Professor Oakes Ames passed away at his winter home in Ormond, Florida, in his 76th year. Internationally known, particularly as a leading orchidologist, his botanical and horticultural activities were devoted with equal success and enthusiasm to research, to teaching, and to administration for more than half a century at Harvard University.

Son of Oliver Ames, a financier and once Governor of the Commonwealth of Massachusetts, and Hannah Coffin Ray Ames, and grandson of Oakes Ames, one of the builders of the Union Pacific Railroad, Oakes Ames was born in North Easton (near Boston), Massachusetts, on September 26, 1874.

His interest in horticulture and botany began early in life, "when, as a boy, he joined his father . . . in the hobby of collecting and identifying the wild flowers of the New England countryside. Young Ames, setting for himself the goal of learn-

[1] Botanist, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture; Research Fellow, Botanical Museum, Harvard University.

ing the name of one new plant each day, began a serious study of the local flora of North Easton, and with a tin biscuit box to serve as a vasculum he roamed the woods and countryside, imagining himself to be exploring strange and distant lands."[2]

He prepared for his university career at Noble & Greenough School in Boston and entered Harvard College in 1894, receiving his A.B. in 1898 and his A.M. from the same institution the following year.

Immediately after receiving his A.M. degree, he began his teaching activities at Harvard, serving from 1900 to 1910 as Instructor of Botany. In 1915, he was named Assistant Professor of Botany, a chair which he held until 1926 when, under President A. Lawrence Lowell, he was appointed Professor of Botany. He served his University in this capacity for six years. Then, from 1932 to 1935, he held the chair of Arnold Professor of Botany and, from 1935 to 1941, Research Professor of Botany. In 1941, Ames retired from his teaching duties, holding the title of Research Professor of Botany, Emeritus, until his death. In 1927, he was named by President Lowell as a member of the Administrative Board of the Graduate School of Arts and Sciences, and, in 1929, as Chairman of the Committee on General Examinations.

Although it is difficult, if not impossible, to consider Ames' teaching and research apart from his administrative activities, so closely were they allied, we may enumerate his administrative appointments separately. From 1898 to 1909, he served as Assistant Director of the Botanical Garden, taking over its complete administration as Director for the next thirteen years, from 1909 to 1922. As early as 1900, Ames, with Professor George Lincoln Goodale, was influential in persuading Mr. Edwin F. Atkins of Boston to establish the Atkins Garden in Cuba. Ames administered this as a dependency of the Botanical Garden in Cambridge for a number of years, since President Lowell did not at first grant the Cuban Garden independent status as a branch of the University. Ames' efforts on behalf of the new-born tropical garden, though not officially recognized by the University, are recorded in his annual reports to the President.

In 1923, he became Curator of the Botanical Museum, a post

[2] Most of the quotation given are from the biographical sketch by P. C. Mangelsdorf in Oakes Ames "Orchids in Retrospect" (1948), Cambridge, Mass.

he held until 1927, when he was appointed Supervisor of the same institution. Later he was named Director of the Botanical Museum by President James B. Conant. He filled this post with characteristic enthusiasm from 1937 to 1945, when, at his own request, he became Associate Director, relinquishing active administration but preserving, until the time of his death, a vital interest in the current research and publications of the Museum.

One of the most demanding of administrative periods during Ames' half century of service at Harvard was from 1927 to 1935, when he was Chairman of the Council of Botanical Collections and Supervisor of the Biological Laboratories as well as of Harvard's Botanical Garden in Cuba and the Arnold Arboretum. This exacting appointment followed the brilliant work he carried out as Chairman of the Committee on the Future Work and Needs of the University in Biology, a post to which he was named in November 1926 by President Lowell. During this whole period, Ames was active in enlisting additional financial support and in creating new entities for biology at Harvard. As Supervisor of the Arnold Arboretum, he more than doubled the endowment of that institution by raising the Charles Sprague Sargent Memorial Fund. The Biological Laboratories at Harvard owe much to his efforts and foresight, for, as Chairman of the Building Committee and subsequently as Supervisor of the Biological Laboratories, he was a leader in drawing up the plans and constructing the large and modern building now housing most of Harvard's experimental biology. Furthermore, he was instrumental in raising extensive financial support for this building and, later, he guided the difficult pioneer amalgamation of three independent departments into the single Department of Biology. It has truly been said of Ames: "Seldom in the history of Harvard University has one man been called upon to fill so many important posts."

When Ames was still a very young man, he became deeply interested in the orchids. It was apparently through two steps that he entered into orchidology. One day, as a boy, he went into his father's room and noticed two flowers of *Dendrobium nobile* in a glass on a table at his father's bedside. These two lone flowers shed such a warm diffusion of color on the otherwise dull scene that Ames was magnetized by their beauty. He

himself later said: "Then and there, I fell in love with orchids and began a collection of my own, using my pitifully small allowance to satisfy my fancy. Cypripediums were cheap, and with them I laid the foundation of a collection which grew by leaps and bounds. Before long I was overwhelmed by the fascination of orchids as a group."

The second step—and the one which crystallized his resolution to devote his academic life to the orchids—was a conversation with Doctor N. L. Britton of the New York Botanical Garden. Sensing the young man's keen interest in the orchids and appreciating in him the qualities of a sound taxonomist, Britton pointed out to Ames that the classification of the *Orchidaceae* was almost hopelessly confused and infantile. He put it up to Ames that to make order of this chaos would need not only a brilliant taxonomist, but extensive financial support. Finally, he suggested that since Ames had the interest, the ability and the wealth, he should make the orchids his field. Ames took the suggestion and immediately began to amass material on a large scale. This decision "has borne rich botanical fruit" for "today, and in no small measure because of his work and that of his associates, the species of the *Orchidaceae* have probably been more thoroughly studied and more completely classified than those of any of the other larger plant families."

The large collection of living orchids which he had built up at his home at North Easton, where he also established the Ames Botanical Laboratory, led him deeper and deeper into an inquisitiveness about the classification, structure and function of the orchids. Eventually, he donated this living collection to the New York Botanical Garden, and gradually transferred most of the Ames Botanical Laboratory to the Harvard Botanical Museum in Cambridge, concentrating his major research efforts in the field of orchid taxonomy.

The Ames Orchid Herbarium, which now comprises 65,000 critically determined specimens as well as large numbers of line drawings, tracings and photographs of type material from the large orchid herbaria of Europe, has become the largest single orchid herbarium in the world. Only the Lindley Herbarium at Kew and the Reichenbach Herbarium in Vienna are comparable in scope; and the Ames Orchid Herbarium has become the center

for most of the taxonomic studies on the orchid flora of the Philippine area and of the New World. His herbarium is unique in having an extensive collection of critically determined floral dissections preserved on glass slides in small metal cabinets, an invaluable aid in rapid determination of new material and in monographic work. Professor Ames gathered together an unusually complete working library of orchid literature, including current journals, from all parts of the world; it forms an integral part of the herbarium. Both the herbarium and the library, now housed in the Botanical Museum in Cambridge, were given to Harvard University in 1941.

In 1904 and 1905, Ames began to publish important taxonomic contributions in the orchid family and, in 1908, appeared his account of the Orchidaceae for the 7th edition of "Gray's New Manual of Botany." His interest and activity in this family soon widened, however, when, in the same period, he undertook the vast task of identifying the orchids of the Philippines, becoming eventually the leading authority on the family for that part of the world. It was early apparent to Ames that nothing could be accomplished without access to the type or classical collections which his European predecessors, Lindley, Reichenbach and others, had accumulated and studied. Accordingly, in 1905, he left to study important European orchid collections and, with his two assistants, Mr. R. G. Leavitt, and Mr. A. A. Eaton, he visited Kew and the British Museum, the Musée d'Histoire Naturelle in Paris and the Rijksherbarium in Leiden.

Ames' work on the orchids became even more extensive and gradually embraced many other parts of the world, especially Florida and the Caribbean area as well as Middle and South America. The collections of Ames and Eaton in Florida led to the publication early in his career of an article entitled "Additions to the Orchid Flora of Southern Florida." This interest in the orchids of Florida, where Ames spent every winter, continued all through his life and was the basis of a number of papers and, very recently, of an extensive book. This book, entitled "Drawings of Florida Orchids" he published jointly with Mrs. Ames who had done all of the illustrations throughout his years of research. His studies of the orchids of Middle and South America prompted him to make trips to Honduras and Brazil. In a

little brochure entitled "Rediscovery of a Lost Orchid" he tells, in his own charming style, the story of his almost accidental finding of an orchid which had never been seen since the type collection.

Professor Ames was fortunate in having as his life-long companion Blanche Ames, an accomplished artist who illustrated all of his technical papers with extraordinarily artistic and accurate line drawings and etchings of the hundreds of new species. This close collaboration between Professor Ames and his wife is almost unique in the history of botany and has led to the publication of some of the most delightful scientific works ever to appear. In 1922, as soon as the Reichenbach Herbarium was opened after it had, in accordance with Reichenbach's will, been sealed from botanical eyes for twenty-five years, Ames and his wife visited Vienna for an exhaustive study of types in this collection. Mrs. Ames executed drawings and analytical sketches of most of the essential material in the Reichenbach and other herbaria for the Ames Orchid Herbarium.

For eighteen years, from 1905 to 1922, Ames, with his wife and sometimes with his collaborators, published a series of seven fascicles entitled "Orchidaceae: Illustrations and Studies of the Family Orchidaceae." Included in these fascicles was a diversity of taxonomic studies comprising the descriptions of new species from the Philippines, British North Borneo and tropical America, monographic work of North American genera such as *Habenaria*, *Pogonia*, and *Spiranthes*, and miscellaneous nomenclatural transfers. This series of fascicles gave way, when research began greatly to increase the output of orchid studies, to a series of papers called "Schedulae Orchidianae" which, with the collaboration of his colleague Mr. Charles Schweinfurth, appeared in ten numbers, extending from 1922 to 1930. Ames, Hubbard and Schweinfurth's "The Genus Epidendrum in North and Middle America," published in 1938, will long remain a model of painstakingly exact taxonomic work.

In recent years Professor Ames' writings on the orchids, have tended to be more philosophic than descriptive and have shown an astonishingly wide range of interest and a profound understanding of all aspects of orchidology, especially the lore of orchidology in the medieval herbals. These papers cover such

a diversity of topics as: "Seed Dispersal in Relation to Colony Formation in *Goodyera pubescens*," "The Evolution of the Orchid Flower," "The Mycorrhiza of *Goodyera pubescens*," "Resupination as a Diagnostic Character in the Orchidaceae, with special reference to *Malaxia monophyllos*," "Pollination of Orchids through Pseudo-copulation," "Observations on the Capacity of Orchids to Survive in the Struggle for Existence," "The Origin of the term Orchis." He frequently contributed articles to the American Orchid Society Bulletin and wrote the "Enumeration of the Orchids of the United States and Canada" for the American Orchid Society. Ames' bibliography numbers more than 300 papers or books on orchids, and in these he described more than 1,000 new species.

Although Oakes Ames will undoubtedly be remembered primarily as the leading orchidologist of his day, he devoted much of his time and interest to economic botany and has so profoundly influenced thought and teaching in this broad field that he must be counted one of the outstanding economic botanists of this century. Ames' first contact with economic botany came during his association with Professor Goodale, his predecessor at the Botanical Museum, who had begun to assemble material and data for exhibits and teaching in this subject. In 1909, Ames himself taught a course which he entitled "Outlines of Economic Botany." His serious interest in the subject took deep roots when in 1914 and 1915 Professor East invited him to offer a course in botany at the Bussey Institution of Applied Botany at Harvard.

As a graduate student, he began to accumulate his own herbarium of plants, wild and cultivated, upon which civilized and primitive man depends for his life. This herbarium, now housed in the Botanical Museum and known as the Economic Herbarium of Oakes Ames, has grown to include 18,000 specimens; it was given to the University in 1940. At the same time, Ames, with the loyal help of Mr. Louis C. Bierweiler, continued to increase the general collection which had been started by Goodale, until, to-day, it is an enormous and enviable collection of plant parts, fibres, woods, extracts and other products which are basic to teaching and research in this field.

Along with the herbarium and plant products collection,

Ames accumulated a unique library of literature on useful plants. This treasury of documents, now known as the Oakes Ames Library of Economic Botany, he liked to refer to as a "gentleman's library"; it comprises approximately 16,000 volumes, pamphlets, theses and reports and has, in addition, a newspaper clipping file. The library covers all aspects—botanical, anthropological, geographical, pharmacological, chemical and agricultural—of useful plants, exclusive of ornamentals. It is most completely indexed as to author, subject (by vernacular and technical name), subject heading, and plates: the work of Ames himself and his associate for many years, Mr. F. Tracy Hubbard. The economic herbarium and library together form a unit unexcelled for completeness in the world.

With this extensive and unique background available to his students, Ames offered his course in economic botany, a course carried on and enlarged to-day by his successor, Professor Paul C. Mangelsdorf. It was, in fact, *only* in economic botany that Ames taught, since no formal courses in the University were ever offered in orchidology. Besides this yearly course—taken eagerly by concentrators in biology, in pre-medical studies, and even in the classics—Ames offered lectures in economic botany and carried out research upon poisonous plants at the Harvard Medical School. Although Professor Ames himself might not have admitted it, he thoroughly enjoyed teaching. Using completely unorthodox methods (preferring to call his lectures "chats") and utterly disregarding fact-cramming, he succeeded in quietly guiding his students into paths of original research which often led them to fields far removed from his own.

Ames' publications in the field of economic botany are few but outstanding. His book "Economic Annuals and Human Culture," written in 1940, has taken its place as one of the most outstandingly original contributions to the whole philosophy of the inter-relationship between plants and man. Written in his clear and concise style, this book developed the thesis that all civilization was dependent upon the angiosperm seed which gave man the chance to invent agriculture; that, later, the seed provided leisure time for him to develop arts and crafts; furthermore, that the annual habit of growth had made it possible for man to subdue plants to his will and to create great surpluses which

increased the amount of leisure time available to him. He argued strongly and convincingly, on the basis of the evidence of the extreme advancement and specialization of our cultivated food annuals, for a far greater age for agriculture, especially in the Americas, than anthropologists were prone to allow. Ames lived to see the soundness of his thesis gain support by several extraordinary archaeological finds which have recently been made.

One of the greatest contributions to the teaching of economic botany, but one which, unfortunately, has never been published, are the so-called "Ames Charts" upon which his course in economic botany at Harvard was based. These are charts showing in the form of a tree the phylogenetic relationships of the more important useful plants. Planned by Professor Ames and beautifully executed in water-color by Mrs. Ames, they have served to orient many a young man overwhelmed with the complexity of plant classification systems.

Although far afield from his own personal interests, paleobotany also felt Ames' influence. Shortly after becoming Director of the Botanical Museum, he decided that the long neglected paleobotanical collection in the Museum—one of the largest in the United States and probably the richest in type and classic material—should again be activated; and it was largely through his own efforts that Mr. William C. Darrah came to Harvard and began research and teaching in paleobotany.

An artist and perfectionist at heart, Professor Ames insisted almost fanatically upon the highest quality in paper, printing and composition to set the highest of standards in scientific publications. He deplored the increasing cheapening of paper and printing in our modern scientific journals. Most of the earlier orchid work of Ames and his associates was privately printed by the best presses in New England. When he became Director of the Botanical Museum, however, Professor Ames decided that an institution as active in such diverse botanical endeavors as he planned to make the Museum needed its own journal. Accordingly, he founded the "Botanical Museum Leaflets of Harvard University." This periodical, issued irregularly in ten numbers to a volume, handsomely illustrated and printed artistically by hand-set type on high-grade paper, is now

in its fourteenth volume and is an outlet for research done by members of the Museum staff. Many botanists are agreed that the establishment of this publication is not the least of Ames' contributions to Harvard Botany and to science in general and that his insistence on the highest of publication standards for scientific output is a refreshing sign in the midst of general deterioration of standards in publishing.

In 1924, the Gold Medal of the American Orchid Society was awarded to Professor Ames for eminent service to orchidology, and five years later he was the recipient of the Centennial Medal of the Massachusetts Horticultural Society for his researches in orchidology. He earned the George Robert White Medal of Honor in 1935 for eminent services in horticulture. In awarding Professor Ames the honorary degree of Doctor of Science in 1938, the President of Washington University stated: "He calls the orchids by name in order that others may likewise know them. Final authority, whose published works, illumined by the accurate, artistic skill of Blanche Ames, his wife, are at once the admiration and envy of the botanical world."

One of the earliest of the many honors conferred upon Oakes Ames, and one which he esteemed very highly throughout his career was his election, on December 7, 1905, as Fellow of the Linnaean Society of London. He was a member and vice-president (1923–1926) of the New England Botanical Club, an honorary member of the American Orchid Society and one of its vice-presidents from its inception in 1921 until his death, honorary vice-president of the Canal Zone Orchid Society, a member of the American Academy of Arts and Sciences and Sigma Xi, and Fellow of the American Association for the Advancement of Science. Amongst the other learned societies to which he belonged, we may enumerate the Botanical Society of America, American Society of Naturalists, Boston Society of Natural History, Biological Society of Washington, New York Academy of Science, Washington Academy of Science, National Institute of Social Science, Association Internationale des Botanistes, Orchid Circle of Ceylon, Torrey Botanical Club, American Fern Society, and the Sullivant Moss Society.

Perhaps the honor and tribute which touched Professor Ames most deeply was the "Fifty-year Dinner" tendered him at Har-

vard University by a group of his colleagues in 1948. On this happy occasion, marking the completion of fifty years of service at Harvard, Professor Ames was unexpectedly presented with "Orchids in Retrospect," a volume beautifully published by the press which he himself had established at the Botanical Museum. This volume brings together a number of Ames' essays on orchidology which "reveal him as his friends know him best in conversation and correspondence, an 'elder statesman' who, rich in the mature wisdom of a lifetime of experience, refuses to take himself, or his subject, too seriously."

On May 15, 1900, Professor Ames married Blanche Ames of Lowell, Massachusetts, and six years later established their lifelong home—"Borderland"—at North Easton. He is survived by Mrs. Ames and by four children, Mr. Oliver Ames of Beverly Farms, Massachusetts, Mrs. Francis T. P. Plimpton of New York City, Mr. Amyas Ames of Cold Spring Harbor, New York, and Mrs. J. Pascall Davis of Nashville, Tennessee.

It would be hard to find a statement more aptly keystoning Oakes Ames' underlying philosophy of life than the Ames family motto: "Fama candida rosa dulcior." His life's work was, indeed, patterned in accord with a deep feeling that a good name is sweeter than a rose. The most outstanding characteristic of Professor Ames' personality was undoubtedly a devotion to his conception of right and justice, and his intolerance of any deviation from these ideals. Another notable characteristic was a combination of calmness of mind with persistence to finish whatever work was at hand. Ames' numerous financial and business commitments would most certainly have proved too distractive a handicap for such a prodigious amount of meticulous scientific research unless he had disciplined his every activity in line with this serene tenacity of purpose.

It is paradoxical that a scholar of such international fame was personally known by so few of his fellow scientists. Oakes Ames was a very shy and retiring man; he disliked large gatherings and fanfare and almost never attended scientific meetings. As a result, few American botanists ever met him. This natural reserve can also be seen in the extreme caution which pervades his scientific writings. From a hasty reading of some of his papers, one might easily assume that Ames lacked confidence in

his grasp of the subject. A closer study, however, provides convincing evidence that Ames was very slow to make any categorical statement, but that when long study and thought had convinced him that he was right, his opinions were set forth fearlessly and without equivocation.

Ames has rightly been called a "perfectionist." His search for the best in all of his scientific endeavors is well known in botanical circles where the factual accuracy of his writings and the completeness of his plant descriptions is so well appreciated. His more philosophical writings sparkle with musical preciseness, and the most abstruse topics are treated with a delightful sprightliness which is often crowned with his whimsical humor. The constant striving towards perfection which early led him to choose the writings of Spenser as his model is seen in his most learned volumes and in his most casual letters.[3]

Like so many other New Englanders, Ames was conservative in politics and liberal in religion. He found little or no conflict between his scientific and his religious philosophy; perhaps the two were one to him. He frequently told his students that they ought to approach their scientific careers with the humbleness which Tennyson expressed in his "Flower in the crannied wall," advice not often heard in these days of materialism. A life-long member of the Unitarian Church of North Easton, Professor Ames' philosophical and religious thinking seemed to be guided by a respectful agnosticism which rebelled at the blind acceptance of authoritarian dogma. His colleagues and students will remember him as a man who, notwithstanding the extent and complexity of his attainments, led a life which was full and fruitful because it was fundamentally so simple.

[3] An illustration follows from an Ames letter to R. E. Schultes, September 5, 1949. "I am more convinced than ever that we must go on naming the fundamental units of evolution. Only an uninformed, a prejudiced or a narrow-minded soul can fail to understand the need for a comprehensive knowledge of every plant and animal to which we owe the urge of life. Charles Darwin wrote the great Bible of Biology only after he had become steeped in the study of species. Certainly Darwin did not turn to 'The origin of species' with an Aristotelian approach. Examine his early studies. This will prove that just a trip round the world cannot make one create thoughts that shatter a shibboleth. Darwin was a systematist in origin and at heart long before he began to build his untottering structure of biological philosophy. Think of Darwin fussing with little Cirripedes at a time when he had to create a new suborder to receive a new Chilean species. His study of Cirripedes should be read by every university president as an introduction to the book which shook the foundation of philosophical thought."

TENTH REPORT OF THE COMMITTEE ON PLANT DISTRIBUTION

The ninth report concluded the family *Gramineae*. The *Cyperaceae*, which would logically follow, have already been dealt with by Prof. Fernald (Rhodora vi. 34). The present report begins with the *Araceae* and with one exception includes the final families of the *Monocotyledoneae*, taken in the order of the eighth edition of Gray's Manual. The *Juncaceae* are not treated, as Prof. Fernald has already done so in a previous report (Rhodora x. 135). Although the *Orchidaceae* were published on by Mr. Emile F. Williams in 1902 (Rhodora iv. 18), they are discussed again at this time.

The data for these reports has been compiled chiefly from the Gray Herbarium and the herbaria of the New England Botanical Club, the Connecticut Botanical Society, the New England Museum of Science, Yale University, the Portland Society of Natural History, Bates College and the University of Maine.

We are indebted to the authorities of the various institutions above mentioned for the privilege of consulting the herbaria under their care and we are particularly indebted to the late C. A. Weatherby for his help and guidance in the preparation of this report.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS—XXXV

The sign + indicates that an herbarium specimen has been seen; the sign − that a reliable printed record has been found.

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Araceae						
Acorus Calamus L.	+	+	+	+	+	+
Arisaema atrorubens (Ait.) Blume	+	+	+	+	+	+
Arisaema atrorubens f. viride (Engler) Fern.	+	+	+	+	+	
Arisaema atrorubens f. zebrinum (Sims) Fern.	+		+	+	+	
Arisaema Dracontium (L.) Schott		−	+	+		+
Arisaema Stewardsonii Britton	+	+	+	+	+	+
Arisaema triphyllum (L.) Schott				+		+
Arisaema triphyllum f. pusillum (Peck) Fern.				+		+
Calla palustris L.	+	+	+	+	+	+
Orontium aquaticum L.				+	+	+
Peltandra virginica (L.) Schott and Endl.	+	+	+	+	+	+
Peltandra virginica f. brachyota Blake		+		+		
Peltandra virginica f. hastifolia Blake	+	+		+	+	+

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Peltandra virginica f. heterophylla (Raf.) Blake				−		
Peltandra virginica f. latifolia (Raf.) Blake	+			+	+	+
Symplocarpus foetidus (L.) Nutt.	+	+	+	+	+	+
LEMNACEAE						
Lemna minor L.	+	+	+	+	+	+
Lemna perpusilla Torr.				+	−	
Lemna trisulca L.	+	+	+	+	+	+
Lemna valdiviana Philippi		+		+	+	+
Spirodela polyrhiza (L.) Schleid.	+	+	+	+	+	+
Wolffia columbiana Karst.			−	+		+
Wolffiella floridana (J. D. Sm.) Thompson				+		
XYRIDACEAE						
Xyris caroliniana Walt.	+	+	+	+	+	+
Xyris caroliniana f. phyllolepis Fern.				−		
Xyris Congdoni Small	+			+	+	+
Xyris montana Ries.	+	+	+	+	+	+
Xyris torta Sm.		+		+	+	+
ERIOCAULACEAE						
Eriocaulon Parkeri Robinson	+			+		+
Eriocaulon septangulare With.	+	+	+	+	+	+
COMMELINACEAE						
Commelina communis L.			−	+	+	+
Commelina diffusa Burm. f.				+		
Commelina virginica L.			−			
Tradescantia ohioensis Raf.				+		+
Tradescantia ohioensis x subaspera				+		
Tradescantia ohioensis x virginiana	+	+		+		+
Tradescantia subaspera Ker.			−			
Tradescantia virginiana L.	+	−	−	+		+
PONTEDERIACEAE						
Heteranthera dubia (Jacq.) Macm.	+		+	+		+
Heteranthera reniformis R. & P.						+
Pontederia cordata L.	+	+	+	+	+	+
Pontederia cordata f. angustifolia (Pursh) Solms	+			+	+	+
Pontederia cordata f. latifolia (Raf.) House	+	+	+	+	+	+
Pontederia cordata f. taenia Fassett	−					
LILIACEAE						
Aletris farinosa L.	+	+		+	+	+
Allium canadense L.	+	+	−	+	+	+
Allium fistulosum L.			+			
Allium oleraceum L.				+		
Allium Schoenoprasum L. var. sibiricum (L.) Hartm.	+	+	+			−
Allium tricoccum Ait.	+	+	+	+	+	+
Allium vineale L.				+	+	+
Asparagus officinalis L.	+	+	+	+	+	+
Chamaelirium luteum (L.) Gray				+		+
Clintonia borealis (Ait.) Raf.	+	+	+	+	+	+
Colchicum autumnale L.		+				
Convallaria majalis L.	+		+	+	+	+
Erythronium americanum Ker.	+	+	+	+	+	+
Erythronium americanum f. castaneum L. B. Smith				+		

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Hemerocallis flava L.			−	+		+
Hemerocallis fulva L.	+	+	+	+	+	+
Hosta japonica (Thunb.) Voss						+
Hosta ventricosa (Salisb.) Stearn				+	+	−
Lilium canadense L.	+	+	+	+	+	+
Lilium canadense f. rubrum Britton			+			
Lilium philadelphicum L.	+	+	+	+	+	+
Lilium philadelphicum f. flaviflorum E. F. Williams	+	+		+		+
Lilium superbum L.		−		+	+	+
Lilium tigrinum Ker.	+	+	+	+	+	+
Maianthemum canadense Desf.	+	+	+	+	+	+
Medeola virginiana L.	+	+	+	+	+	+
Melanthium hybridum Walt.						−
Muscari botryoides (L.) Mill.			+	+	+	+
Muscari racemosum (L.) Mill.				+		+
Ornithogalum umbellatum L.	+		+	+	+	+
Polygonatum biflorum (Walt.) Ell.						+
Polygonatum canaliculatum (Muhl.) Pursh		+	+	+	+	+
Polygonatum latifolium (Jacq.) Desf.				+		
Polygonatum pubescens (Willd.) Pursh	+	+	+	+	+	+
Polygonatum pubescens f. fultius Fern. & Harris			−	+		
Scilla sibirica Andr.				+		
Smilacina racemosa (L.) Desf.	+	+	+	+	+	+
Smilacina racemosa var. cylindrata Fern.		+	+	+	+	+
Smilacina stellata (L.) Desf.	+	+	+	+	+	+
Smilacina stellata var. cressa Vict.				+		+
Smilacina trifolia (L.) Desf.	+	+	+	+	+	+
Smilax Bona-nox L. var. hederaefolia (Beyr.) Fern.				+		
Smilax glauca Walt. var. leurophylla Blake				+	+	+
Smilax herbacea L.	+	+	+	+	+	+
Smilax pulverulenta Michx.					+	
Smilax rotundifolia L.	+	+		+	+	+
Smilax tamnoides L. var. hispida (Muhl.) Fern.						−
Streptopus amplexifolius (L.) DC. var. americanus Schultes	+	+	+	+		+
Streptopus amplexifolius var. oreopolus (Fern.) Fassett	+	+				
Streptopus roseus Mich. var. perspectus Fassett	+	+	+	+	+	+
Tofieldia glutinosa (Mich.) Pers.	+	+	+			
Trillium cernuum L.	+	+	+	+	+	+
Trillium cernuum var. macranthum Wieg.			+	+		+
Trillium erectum L.	+	+	+	+	+	+
Trillium erectum f. albiflorum R. Hoffm.	+			+		
Trillium erectum f. luteum Louis-Marie	+	+	+	+		+
Trillium grandiflorum (Michx.) Salisb.	+	+	+	−		+
Trillium undulatum Willd.	+	+	+	+	+	+
Trillium undulatum f. Cleavelandicum (Wood) Fern.	+	+				
Trillium undulatum f. polymerum Victorin	+	+	+	+		
Uvularia grandiflora Sm.		+	+	+		+
Uvularia perfoliata L.			+	+	+	+
Uvularia sessilifolia L.	+	+	+	+	+	+
Veratrum viride Ait.	+	+	+	+	+	+
Yucca Smalliana Fern.				+		+
Zigadenus glaucus Nutt.			+			

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
HAEMODORACEAE						
Lachnanthes tinctoria (Walt.) Ell.				+	+	+
DIOSCOREACEAE						
Dioscorea villosa L.				+	+	+
Dioscorea villosa f. glabrifolia (Bartlett) Fern.					+	+
AMARYLLIDACEAE						
Hypoxis hirsuta (L.) Coville	−	+	−	+	+	+
Leucojum aestivum L.	+					+
Narcissus poeticus L.	−			−		+
Narcissus Pseudo-Narcissus L.			−	+		−
IRIDACEAE						
Belamcanda chinensis (L.) DC.			+			+
Crocus vernus All.				+		
Iris germanica L.				−		+
Iris Hookeri Penny	+					
Iris laevigata Fisch.						−
Iris orientalis Mill.						+
Iris prismatica Pursh	+	+		+	+	+
Iris prismatica x versicolor				+		
Iris pumila L.	+					
Iris Pseudacorus L.			+	+	+	+
Iris versicolor L.	+	+	+	+	+	+
Sisyrinchium angustifolium Mill.	+	+	+	+	+	+
Sisyrinchium arenicola Bicknell				+	+	+
Sisyrinchium atlanticum Bicknell	+	+	+	+	+	+
Sisyrinchium montanum Greene var. crebrum Fern.	+	+	+	+	+	+
Sisyrinchium mucronatum Michx.	+		+	+		+
ORCHIDACEAE						
Aplectrum hiemale (Muhl.) Torr.			+	+		−
Arethusa bulbosa L.	+	+	+	+	+	+
Calopogon pulchellus (Salisb.) R. Br.	+	+	+	+	+	+
Calypso bulbosa (L.) Oakes	+	+	+	+		
Corallorhiza maculata Raf.	+	+	+	+	+	+
Corallorhiza maculata f. flavida (Peck) Farwell	+		−			−
Corallorhiza odontorhiza (Willd.) Nutt.	+		+	+	+	+
Corallorhiza odontorhiza f. flavida Wherry						−
Corallorhiza trifida Chatelain var. verna (Nutt.) Fern.	+	+	+	+	+	+
Cypripedium acaule Ait.	+	+	+	+	+	+
Cypripedium acaule f. albiflorum Rand & Red.	+	+	−	−		
Cypripedium arietinum R. Br.	+	+	+	+		
Cypripedium Calceolus L. var. parviflorum (Salisb.) Fern.	+	+	+	+		+
Cypripedium Calceolus L. var. pubescens (Willd.) Correll	+	+	+	+	+	+
Cypripedium reginae Walt.	+	−	+	+		+
Epipactis Helleborine (L.) Crantz		−	+	+		+
Goodyera oblongifolia Raf.	+		−			
Goodyera pubescens (Willd.) R. Br.	+	+	+	+	+	+
Goodyera repens (L.) R. Br. var. ophioides Fern.	+	+	+	+		+
Goodyera tesselata Lodd.	+	+	+	+		+
×Habenaria Andrewsii M. White (lacera x psycodes)	+	+	+	+		+
Habenaria blephariglottis (Willd.) Hook.	+	+	+	+	+	+

	Me.	*N. H.*	*Vt.*	*Mass.*	*R. I.*	*Conn.*
Habenaria ciliaris (L.) R. Br.			−	+	+	+
Habenaria cristata (Michx.) R. Br.				+		
Habenaria clavellata (Michx.) Spreng.	+	+	+	+	+	+
Habenaria clavellata var. ophioglossoides Fern.	+	+	+	+	+	
Habenaria dilatata (Pursh) Hook.	+	+	+	+		+
Habenaria fimbriata (Ait.) R. Br.	+	+	+	+	+	+
Habenaria fimbriata f. albiflora Rand & Redfield	+	+				
Habenaria fimbriata f. mentotonsa Fern.	+					
Habenaria fimbriata x hyperborea			−			
Habenaria flava (L.) Spreng. var. herbiola (R. Br.) Ames & Correll	+	+	+	+	+	+
Habenaria Hookeri Torr.	+	+	+	+		+
Habenaria hyperborea (L.) R. Br.	+	+	+	+	+	+
Habenaria hyperborea var. huronensis (Nutt.) Farw.			−			
Habenaria lacera (Michx.) Lodd.	+	+	+	+	+	+
Habenaria leucophaea (Nutt.) Gray	+		−			
Habenaria macrophylla Goldie	+	+	+	+		−
×Habenaria media (Rydb.) Niles		−	+			
Habenaria obtusata (Pursh) Richards.	+	+	+	+		
Habenaria orbiculata (Pursh) Torr.	+	+	+	+		−
Habenaria psycodes (L.) Spreng.	+	+	+	+	−	+
Habenaria psycodes f. albiflora (Bigel.) R. Hoffm.			−	−		
Habenaria psycodes f. ecalcarata (Bryan) Dole			−			
Habenaria viridis (L.) R. Br. var. bracteata (Muhl.) Gray	+	+	+	+	+	+
Isotria medeoloides (Pursh) Raf.	−	+		+	+	+
Isotria verticillata (Willd.) Raf.	+	+	+	+	+	+
Liparis liliifolia (L.) Richard		−	+	+		+
Liparis Loeselii (L.) Richard	+	+	+	+	+	+
Listera auriculata Wiegand	+	+	+			
Listera australis Lindl.			+			
Listera convallarioides (Sw.) Nutt.	+	+	+			
Listera cordata (L.) R. Br.	+	+	+	+	+	
Malaxis brachypoda (Gray) Fern.	+	+	+	+		+
Malaxis unifolia Michx.	+	+	+	+	+	+
Orchis rotundifolia Banks	+		+			
Orchis spectabilis L.	+	+	+	+	−	+
Pogonia ophioglossoides (L.) Ker.	+	+	+	+	+	+
Pogonia ophioglossoides f. albiflora Rand & Red.				−		
Spiranthes cernua (L.) Richard	+	+	+	+	+	+
Spiranthes cernua var. ochroleuca (Rydb.) Ames	+	+	−	+		+
Spiranthes gracilis (Bigel.) Beck	+	+		+	+	+
Spiranthes lacera Raf.	+	+	+	+	+	
Spiranthes lacera x Romanzoffiana	+					
Spiranthes lucida (H. H. Eaton) Ames	+	+	+	+		+
Spiranthes Romanzoffiana Cham.	+	+	+	+		+
Spiranthes tuberosa Raf. var. Grayi (Ames) Fern.	+	+		+	+	+
Spiranthes vernalis Engelm. & Gray		+		+	+	+
Tipularia discolor (Pursh) Nutt.			−	+		+
Triphora trianthophora (Sw.) Rydb.	−	+	+			+

Two species which might have been included in the above list have very dubious claims to a place in the New England Flora. *Sisyrinchium albidum* was found once on Drake's Island, Wells, in York County, Maine. Its natural range is much farther to the west and its inclusion in our floral area is extremely doubtful. The report of *Gymnadenia conopsea*, a European orchid, at Litchfield, Connecticut, is authenticated by a specimen collected by Miss Anna M. Vail and now in the herbarium of the Torrey Botanical Club. This collection, the only one known from North America, is cited in "Additions to the Flora of Connecticut," Bulletin 48, State Geological and Natural History Survey, 1930. No one has ever been able to relocate the station.

In the list of plants which are discussed in this article the nomenclature of the Eighth Edition of Gray's Manual has been followed and so no references to Rhodora or other botanical literature has seemed necessary,

One of the introduced species listed is, strangely enough, an orchid, *Epipactis Helleborine*. Williams did not include it in his 1902 list but commented on its introduction at Stockbridge, Mass. where "it was hardly likely to persist, as it selected a hedge along the main street for a habitat." It has, however, persisted and now we have seen specimens from three states and reliable records from a fourth. In 1948 another station was reported at Stockbridge and a new one at Coventry, Conn.

An introduced species which is familiar to everyone is *Hemerocallis fulva*. It originated in China and does not set seed. All the thousands of plants growing all over the country are the progeny of a single individual. It is an example of the efficiency of vegetative multiplication.

Geographically the species here considered fall into groups which have already been used and defined in previous reports. Varieties and forms which seem to have no geographic significance in our area are omitted as usual.

I. generally distributed.—*Acorus Calamus, Eriocaulon septangulare, Pontederia cordata, Maianthemum canadense, Medeola virginica, Trillium cernuum, Uvularia sessilifolia, Iris versicolor, Sisyrinchium montanum* var. *crebrum, Arethusa bulbosa, Calopogon pulchellus, Corallorhiza maculata, Cypripedium acaule, Habenaria fimbriata, Liparis Loeselii, Malaxis unifolia, Pogonia ophioglossoides.*

While the above species are widely distributed, this does not mean that they occur in the same relative abundance. For example, *Iris versicolor* occurs in masses, but *Arethusa bulbosa*, if you reach the proper habitat, will yield comparatively few individuals. *Acorus Calamus* and *Pontederia cordata* are not found in northern Maine though otherwise are generally distributed. *Trillium cernuum* is not represented from the outer towns on the tip of Cape Cod nor on Martha's Vineyard or Nantucket. There are several of the orchids which are not found in the outer townships of Cape Cod—*Arethusa bulbosa, Corallorhiza maculata, Habenaria fimbriata* and *Malaxis unifolia.* This is probably due to the lack of a suitable habitat.

II. RATHER GENERAL EXCEPT NORTHERN MAINE AND WASHINGTON COUNTY COAST.—*Arisaema atrorubens, A. Stewardsonii, Symplocarpus foetidus, Lemna minor, Spirodela polyrhiza, Lilium philadelphicum, Polygonatum pubescens, Sisyrinchium angustifolium, Goodyera pubescens, Habenaria lacera, Spiranthes cernua.*

Arisaema atrorubens and *A. Stewardsonii* do not reach Nantucket. *Spirodela polyrhiza* and *Goodyera pubescens* are not found on either Martha's Vineyard or Nantucket, nor do they occur in the outer townships of Cape Cod. *Symplocarpus foetidus* has a rather thin representation in the northern part of its range.

III. RATHER GENERAL EXCEPT IN SOUTHEASTERN MASSACHUSETTS AND WASHINGTON COUNTY COAST.—*Allium tricoccum, Erythronium americanum, Veratrum viride, Cypripedium Calceolus* var. *parviflorum* and var. *pubescens, C. reginae, Habenaria flava* var. *herbiola, H. Hookeri, H. hyperborea, H. viridis* var. *bracteata, Orchis spectabilis.*

Some of these species are definitely infrequent in northern Maine. Aroostook County is represented by only two specimens of *Erythronium americanum* and by only one each of *Allium tricoccum* and *Habenaria flava* var. *herbiola; Orchis spectabilis* has only one station north of 45° in Maine.

IV. RATHER GENERAL EXCEPT SOUTHEASTERN MASSACHUSETTS.—*Calla palustris, Clintonia borealis, Lilium canadense, Smilacina trifolia, Streptopus roseus* var. *perspectus, Trillium erectum, T. undulatum, Corallorhiza trifida.*

V. RATHER GENERAL EXCEPT THE WASHINGTON COUNTY COAST.—*Smilacina racemosa, S. stellata, Smilax herbacea, Habenaria blephariglottis, H. psycodes.*

Smilacina stellata, except for extreme northern Maine, seems to be lacking in most of the eastern part of the state. *Habenaria blephariglottis* is absent from western Vermont and largely from western Massachusetts and is also absent on the coast east of Casco Bay. *Habenaria psycodes* is not found in the lower Cape Cod area nor on Nantucket.

VI. NORTHERN, WITH NUMEROUS STATIONS SOUTH OF 43°.—*Goodyera repens* var. *ophioides*, *G. tesselata*, *Habenaria clavellata* var. *ophioglossoides*, *H. dilatata*, *H. macrophylla*, *H. orbiculata*, *Spiranthes lacera*.

Habenaria clavellata was recently divided by Prof. Fernald (Rhodora xlviii. 161) and he points out that the typical plant with long petiolate leaves is definitely southern with outlying stations, many of them transitional, in central New Hampshire, along the Maine coast and at Houlton, Ft. Fairfield, and Ft. Kent. The variety *ophioglossoides* with short broad leaves is definitely northern with outposts as far south as Cape Cod and Providence. In like manner the material passing as *Spiranthes gracilis* was recently shown by Prof. Fernald to fall into two distinct species, *S. gracilis* and *S. lacera* (Rhodora xlviii. 5). Although *S. lacera* is the northern segregate, it is entirely absent in northern Maine.

VII. NORTHERN, NOT MUCH SOUTH OF 43°.—*Allium Schoenoprasum* var. *sibiricum*, *Streptopus amplexifolius* var. *americanus*, *Tofieldia glutinosa*, *Calypso bulbosa*, *Cypripedium arietinum*, *Goodyera oblongifolia*, *Habenaria obtusata*, *Listera auriculata*, *L. cordata*, *L. convallarioides*, *Malaxis brachypoda*, *Orchis rotundifolia*, *Spiranthes Romanzoffiana*.

Orchis rotundifolia definitely belongs in this group, but there are very few specimens upon which to base such a classification. These comprise four from Maine and five from Vermont. *Goodyera oblongifolia* occurs in extreme northern Aroostock County, Maine and there are two records from Vermont. *Streptopus amplexifolius* var. *americanus*, *Malaxis brachypoda* and *Spiranthes Romanzoffiana*, unlike the other species in this group, have a few stations in western Massachusetts and Connecticut.

VIII. CHIEFLY THE THREE SOUTHERN STATES.—*Peltandra virginica*, *Lemna perpusilla*, *Xyris caroliniana*, *Aletris farinosa*, *Allium canadense*, *Smilacina racemosa* var. *cylindrata*, *Smilax rotundifolia*, *Hypoxis hirsuta*, *Sisyrinchium atlanticum*, *Habenaria clavellata*.

Some of these species are found along the Maine coast; *Sisyrinchium atlanticum*, for example, extends as far as Eastport. *Lemna perpusilla* and *Smilacina racemosa* var. *cylindrata*, however, do not appear in Maine at all and *Hypoxis* is represented by only a single record. *Lemna perpusilla* is only represented from Duxbury, Plympton, and Stockbridge, Mass. and Barrington, R. I.

IX. CHIEFLY THE THREE SOUTHERN STATES BUT NOT IN WESTERN MASSACHUSETTS.—*Arisaema triphyllum, A. triphyllum* f. *pusillum, Orontium aquaticum, Lemna valdiviana, Xyris torta, Habenaria ciliaris, H. cristata, Spiranthes gracilis, S. tuberosa* var. *Grayi.*

The only record of *Habenaria cristata*, a species of more southern distribution, is from South Dartmouth, Mass., where it has not been found in recent years. It is very questionably included in our flora.

X. CHIEFLY THE THREE SOUTHERN STATES BUT NOT ON CAPE COD.—*Polygonatum canaliculatum, Uvularia perfoliata, Corallorhiza odontorhiza, Isotria medeoloides, I. verticillata, Triphora trianthophora.*

XI. CHIEFLY THE THREE SOUTHERN STATES BUT NEITHER CAPE COD NOR IN WESTERN MASSACHUSETTS.—*Dioscorea villosa, Spiranthes vernalis.*

There is only one station for *Dioscorea villosa* in Massachusetts.

XII. COASTAL PLAIN.—*Xyris Congdoni, Lilium superbum, Smilax Bona-nox* var. *hederaefolia, S. glauca* var. *leurophylla, Lachnanthes tinctoria, Iris prismatica, Sisyrinchium arenicola.*

Judging from the distribution of their stations *Smilax Bona-nox* var. *hederaefolia, Lachnanthes tinctoria* and *Sisyrinchium arenicola* are true coastal plain plants, though *Lachnanthes tinctoria* does not occur on either Martha's Vineyard or Nantucket and the only occurrence of *Smilax Bona-nox* var. *hederaefolia* is on Nantucket. The other species extend inland to some extent and are more coastal than coastal plain in nature.

XIII. WESTERN NEW ENGLAND ONLY.—*Arisaema Dracontium, Chamaelirium luteum, Trillium grandiflorum, Uvularia grandiflora, Aplectrum hyemale, Liparis liliifolia.*

While there is a station for *Trillium grandiflorum* in Maine and one in New Hampshire, the species otherwise in the New England area is decidedly western. *Chamaelirium luteum* is confined to western Connecticut and southwestern Massachu-

setts. *Liparis liliifolia* seems to belong here but it also has stations in the eastern Massachusetts rich woods area.

XIV. MARITIME WITH NO INLAND STATIONS.—*Iris Hookeri.*

This species is the only representative of this group and in New England it is confined to the Maine coast east of the Penobscot River.

XV. ESTUARINE.—*Eriocaulon Parkeri.*

XVI. INTRODUCED SPECIES.—*Commelina communis, C. diffusa, C. virginica, Tradescantia ohioensis, T. subaspera, T. virginiana, Allium fistulosum, A. oleraceum, A. vineale, Asparagus officinalis, Colchicum autumnale, Convallaria majalis, Hemerocallis flava, H. fulva, Hosta japonica, H. ventricosa, Lilium tigrinum, Muscari botryoides, M. racemosum, Polygonatum latifolium, Scilla sibirica, Yucca Smalliana, Leucojum aestivum, Narcissus poeticus, N. Pseudo-Narcissus, Belamcanda chinensis, Crocus vernus, Iris germanica, I. laevigata, I. orientalis, I. pumila, I. Pseudacorus, Epipactis Helleborine.*

Many of these introduced species merely persist without showing much evidence of becoming aggressive though *Allium vineale,* occurring only in southern New England, has become a bad weed in some places.

XVII. MISCELLANEOUS.—*Lemna trisulca, Xyris montana, Heteranthera dubia, H. reniformis, Melanthium latifolium, Polygonatum biflorum, Streptopus amplexifolius* var. *oreopolos, Sisyrinchium mucronatum, Habenaria Andrewsii, H. clavellata, Spiranthes lucida.*

Lemna trisulca might be classified as chiefly in the three southern states, but it occurs up the Champlain Valley, at the mouth of the Penobscot River and there is one station in Aroostook County. *Xyris montana,* while it has one station in Aroostook County, is otherwise all south of 45°. *Heteranthera dubia* and *Sisyrinchium mucronatum* occur for the most part in Connecticut and southwestern Massachusetts, but with outlying stations in the Penobscot Valley in Maine and also in the Champlain Valley. *Heteranthera reniformis, Melanthium hybridum* and *Polygonatum biflorum* are found only in southwestern Connecticut with too few stations to be classified definitely in New England. *Streptopus amplexifolius* var. *oreopolus* in New England occurs only on Mt. Washington and Mt. Katahdin. *Habenaria clavellata* is distinctly southern but it occurs in all the New England states and does not fit into any of the above groups. x *H.*

Andrewsii is found occasionally with its parents. *Spiranthes lucida*, a southern species, extends northward throughout Vermont and as far east as central Maine. It is not found in Rhode Island nor west of the Connecticut River in Massachusetts.

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PENTHORUM: ITS CHROMOSOMES

J. T. Baldwin, Jr. and Bernice M. Speese

Penthorum L. is of widespread occurrence in North America and Asia and is variously interpreted to consist of one, two, or three species. The genus is found, as *P. sedoides* L., from New Brunswick to Texas, from Ontario and Minnesota to Florida. It grows in wet low places and exhibits the extreme vegetative variability often expressed by plants subjected to periodic inundations. Representatives of the genus in Asia are frequently referred to this same species.

The affinities of *Penthorum* are puzzling. The genus has sometimes been placed in the *Crassulaceae;* for example: De Candolle (1828) established Tribe *Crassulaceae Anomalae* for *Diamorpha* Nutt. and *Penthorum;* Torrey and Gray (1840) put these genera together in Tribe *Diamorpheae;* Schönland (1894) incorporated *Penthorum* between *Diamorpha* and *Triactina* Hook. f. & Th. But Berger (1930) omitted *Penthorum* from his monograph on the *Crassulaceae*, and Fernald (1950) broke with the practice in the previous editions of *Gray's Manual* by assigning this genus to the *Saxifragaceae* rather than to the *Crassulaceae.* This accords with the work of certain other investigators. Baillon (1872) referred *Penthorum* to a monotypic tribe, and Engler (1930) to a monotypic subfamily, of the *Saxifragaceae.* On the basis of morphological and anatomical data, van Tieghem (1899) erected the *Penthoraceae* as a family for the genus, and Rydberg (1932) and Small (1933) followed van Tieghem's treatment.

In the course of embryological studies of American and Asiatic plants of *Penthorum sedoides*, Rocén (1928) counted eight prophase chromosomes in embryo-sac and pollen-mother-cell divi-

sions. Mauritzon (1933) interpreted embryological observations to mean that the genus showed closer relationship to the *Saxifragaceae* than to the *Crassulaceae;* Skovsted (1934), relying on chromosome numbers then known for the two families, was of the opposite view. Baldwin (1940) reported *n*-numbers of 9 and 2*n*-numbers of 18 for *P. sedoides* from Virginia and for *Diamorpha cymosa* (Nutt.) Britt. from Alabama, Georgia, and North Carolina (and later found these numbers for *D. cymosa* near Rugby, Morgan Co., Tennessee). These and other chromosomal data suggested that *Penthorum* rightly belonged in the *Crassulaceae.*

Subsequent study has confirmed these observations on the chromosomes of American representatives of *Penthorum sedoides.* Prof. Chien P'ei, Institute of Botany, Academia Sinica, Shanghai, and Prof. Albert N. Steward, Department of Botany, University of Nanking, Nanking, each sent us seed identified by them as *Penthorum sedoides.* We found plants from seed of both those sources to have *n*-numbers of 8, 2*n*-numbers of 16. Analysis of material from China thus substantiates Rocén's report. That two different chromosome numbers are present is an indication that the American and Asiatic plants belong to different species. No suggestion is made here as to what family *Penthorum* should be relegated.

Geographic sources, chromosome numbers, and the collectors of American plants of *P. sedoides* investigated by us are listed:

	n	*2n*	
New York			
Tioga Co.: Flemingsville		18	R. T. Clausen
Indiana			
Wells Co.: Bluffton		18	C. C. Deam
Arkansas			
Washington Co.: Springdale		18	D. M. Moore
Virginia			
James City Co.: Five Forks	9		R. W. Menzel
Williamsburg	9	18	B. M. Speese
Clarke Co.: Boyce	9	18	J. T. Baldwin, Jr.
Shenandoah Co.: Fort Valley		18	J. T. Baldwin, Jr.
Strasburg		18	J. T. Baldwin, Jr.
Amelia Co.: Amelia Courthouse		18	J. B. Lewis.

As records of some of the plants for which chromosomes were investigated, the following specimens have been placed in the Herbarium of the U. S. National Arboretum, Beltsville, Mary-

land: *Baldwin 5351*, Shenandoah Co., Virginia; *Baldwin 14537*, James City Co., Virginia; and *Baldwin 14538*, plant from seed sent by Professor Steward from Nanking, China.

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RANGE EXTENSIONS OF MARSH AND AQUATIC PLANTS. 2.

Neil Hotchkiss

In the ten years since the author published "Range Extensions of Marsh and Aquatic Plants" (Rhodora 42: 20–22, January, 1940), biologists of the Fish and Wildlife Service, United States Department of the Interior (successor to Bureau of Biological Survey, Department of Agriculture) have made additional discoveries that seem worth recording. A specimen of each collection cited has been deposited in the United States National Herbarium and duplicates of some are in the Gray Herbarium. Identifications are by the writer, except as otherwise noted.

Carex distans L. Determined by E. Nelmes, Royal Botanic Gardens, Kew, courtesy of F. J. Hermann of the United States Department of Agriculture. Common in a damp meadow at the edge of a marsh near the north end of the Potomac River bridge, Morgantown, Charles County, Maryland, June 24, 1948, *N. Hotchkiss and F. M. Uhler No. 7218.*

This appears to be the first North American record for this widespread European species.

Carex extensa Good. Determined by E. Nelmes, Royal Botanic Gardens, Kew, courtesy of F. J. Hermann of the United States Department of Agriculture. Brackish marsh at Dames Quarter, Somerset County, Maryland, July 3, 1948, *F. M. Uhler.*

The eighth edition of Gray's Manual (page 368) gives the habitat and range of this species as "Coastal sands, local, L. I. and Coney I., N. Y.; Norfolk Co., Va."

Wolffia papulifera C. H. Thompson. Drowned-woods pond on Charles Branch, near Croom Station, Prince George's County, Maryland, September 6, 1947, *N. Hotchkiss No. 7184;* drowned-woods pond one mile northwest of Port Richmond, King William County, Virginia, June 25, 1948, *N. Hotchkiss and F. M. Uhler No. 7220;* marshy pond in Pitcherdam Creek, two miles north-northeast of Seward, Dorchester County, Maryland, September 30, 1949, *N. Hotchkiss No. 7284;* and pond along state highway 416 at Lyons Creek, Calvert County, Maryland, October 1, 1949, *N. Hotchkiss No. 7286.*

The eighth edition of Gray's Manual (page 387) gives the range of this species as "Local, Va. to Ill., Ky., Mo. and Kans. (Mex.)." In a letter to the author dated July 14, 1948, M. L. Fernald cited one Virginia locality (Courtland, Southampton County, *Leslie Hubricht No. B2862*). Recently, Don L. Jacobs reported *W. papulifera* from Columbia County, Florida (The American Midland Naturalist 42: 110–111. July 1949).

Aneilema Keisak Hassk. In an earlier article (Rhodora 42: 21), *N. Hotchkiss and C. Cottam No. 4776* from Georgetown County, South Carolina was mistakenly reported as *Aneilema nudiflorum* (L.) Kunth. This collection is *A. Keisak.* Other collections are as follows: Marsh meadow, Cat Point Creek, Richmond County, Virginia, September 4, 1947, *N. Hotchkiss and F. M. Uhler No. 7179;* tidal marsh, Rappahannock River at Port Conway, King George County, Virginia, September 4, 1947, *N. Hotchkiss and F. M. Uhler No. 7181;* cattail-alligatorweed marsh, Smith Creek, Wilmington, New Hanover County, North Carolina, August 12, 1948, *N. Hotchkiss No. 7229;* old ricefield marsh on the east side of the Waccamaw River along U. S. highway 17, Georgetown County, South Carolina, August 13, 1948, *N. Hotchkiss No. 7232;* old ricefield marsh on Black River along U. S. highway 701, Georgetown County, South Carolina, August 13, 1948, *N. Hotchkiss No. 7236;* with alligatorweed in a slough on the Savannah River flood plain along U. S. highway 17, Jasper County, South Carolina, August 15, 1948, *N. Hotchkiss No. 7238;* old ricefield marsh on the Altamaha River along U. S. highway 17, McIntosh County, Georgia, September 2, 1948, *N. Hotchkiss No. 7267;* marsh draining

into Horseshoe Creek on state highway 32 northeast of Ashepoo, Colleton County, South Carolina, September 2, 1948, *N. Hotchkiss No. 7270;* Big Hunting Creek, Fairfax County, Virginia, September 10, 1949, *F. M. Uhler.*

The eighth edition of Gray's Manual (page 393) gives the habitat and range of this species as "Fresh tidal marshes and shores, se. Va." In Rhodora 42: 441, M. L. Fernald cites collections from six Virginia counties. Fernald's discussion in Rhodora 42: 511–513 led to the corrected identification of the Georgetown County, South Carolina specimen and stimulated the search for stations south of Virginia. *A. Keisak* is now known from nine counties in Virginia, one in North Carolina, three in South Carolina, and one in Georgia. The stations are all within the influence of tide on the Potomac, Rappahannock, Mattaponi, Pamunkey, James, Blackwater, Cape Fear, Waccamaw, Black, Santee, Ashepoo, Savannah, and Altamaha Rivers.

Myriophyllum verticillatum L. Stikine Flats, southeastern Alaska, July 30, 1942, *L. J. Palmer No. 720.*

Neither Eric Hultén's "Flora of Alaska and Yukon. VII" (pages 1158–1160. 1947) nor J. P. Anderson's "Flora of Alaska and Adjacent Parts of Canada. Part VII. Geraniaceae to Plumbaginaceae" (Iowa State College Journal of Science 23: 149. January 1949) record this species.

U. S. Fish and Wildlife Service, Laurel, Md.

Tussilago farfara in Maryland.—The Eurasian coltsfoot, *Tussilago farfara* L., which is well established in clayey soils from Newfoundland to Minnesota, extending south to New Jersey, Pennsylvania and Ohio, has apparently never been reported from Maryland. On 25 Sept. 1938 I found two small clumps close together at the base of the Calvert Cliffs along Chesapeake Bay about half a mile above the wharf at Governor Run (now known as Kenwood Beach), Calvert County, Maryland. The following spring (on 5 March), I found 4 flowering stems on the clayey slope of the cliffs about half a mile below the wharf in the same region. The plant has persisted in both places. In the autumn of 1949 I counted about 40 clumps of it at the downstream locality, and in the autumn of 1950 about 16 plants at the upper one. They grow mainly on the clayey-sandy talus at

the foot of the cliffs, a habitat exposed to constant disturbance or destruction by the frequent high tides of the area. The original source of the introduction here is not evident. I have never seen it cultivated in this region.—S. F. Blake, Division of Plant Exploration and Introduction, Plant Industry Station, Beltsville, Maryland.

The Cacti of Arizona[1]—This, the second edition, is a small book with a stiff binding, differing in that respect from the thin flexible-covered first edition which appeared in 1940 as University of Arizona Bulletin, Biological Science Bulletin No. 5. The page size is approximately the same in the two editions and many of the same illustrations are used, but the type and format of the second edition marks a considerable improvement over the first. Also, one sees improvements in the handling of certain plates such as No. X of edition 1 now altered to produce Plates VI and VII of the new edition with less reduction of the photographs; and Plate XXII similarly changed to become Plate XVII with the elimination of one of the photographs. Several colored plates of paintings by Lucretia Breazeale Hamilton are not included in the second edition, but a new colored Plate (XXI), showing the saguaro and organ pipe cacti in their natural settings and including a bit of vivid Arizona sky, is a welcome addition. The maps showing the distribution of various species of cacti in Arizona are reproduced in black in this edition. In the earlier one, the actual range of each species was shown in green. I do not see that the new maps are an improvement, but they were undoubtedly cheaper and less subject to error in reproduction.

The fact that a second edition of this work was called for is a high recommendation of it. This is particularly true when one considers the fact that the book treats but a single family of plants in a relatively restricted geographic area. Counteracting this narrowness of scope to some extent is the wide popular interest in cacti, but one of the most important factors governing the large demand was Dr. Benson's inclusion of general well-illustrated material on the morphology of the cactus flower, notes on how to identify cacti and how to grow them. The new edition continues these features.

There are some changes in the classification of the Cacti in the second edition. These in general appear to represent more matured judgements of taxonomic relationships on the part of Dr. Benson, resulting from a consideration of more adequate material and a longer period of study on the problems involved. The trend in the second edition is toward the recognition of fewer species and the inclusion of some of the taxons formerly treated as species in varietal status. In *Opuntia* there are 32 species in edition 1 and 26 in edition 2. The greatest reduction was in *Echinocereus* from 10 to 5 species. Other genera were handled about the same in the two editions. The omission of an index, which to my mind is a must in a book of this sort, might be rectified if another edition is required.—R. C. Rollins.

[1] The Cacti of Arizona, by Lyman Benson. XIII + 135 pp. with XXIX plates and 33 figures. $4.00. The University of Arizona Press, Tucson. Published at the University of New Mexico Press, Albuquerque. 1950.

Some Irish Naturalists[1]—From the age of six when his grandfather, Robert Patterson, first showed him the Adder's-tongue, *Ophioglossum*, Robert Lloyd Praeger has continued an absorbing interest in natural history, particularly in botany and zoology. Now in his eighty-sixth year he has brought together an album of some 320 Irish naturalists, dating from the seventh century. Praeger himself has "met and known every outstanding naturalist working in Ireland; whether on rocks, animals, plants, insects, fishes or other branches of [natural history]." He became a member of the Belfast Naturalists' Field Club at the age of eleven, and a judge of fern exhibits at the Temple Show at seventeen. After a youth spent in and near Belfast, he went to Dublin in 1893 and remained with the National Library until his retirement in 1923. In 1901 he published *Irish Topographical Botany* and later *The Botanist in Ireland*. He edited the *Irish Naturalist* from its beginning in 1892 throughout its thirty-three years of existence. But it is for his monographic work on the genera *Sedum* and *Sempervivum* that Praeger is best known in America.

Some Irish Naturalists consists of three chief parts, viz., "Some Personal Contacts," telling of Praeger's more intimate scientific associations; "Brief Biographical Notices," a roster making up the bulk of the book; and "Societies, Institutions, Team-work," a summary of the activities of twenty-four organizations, field surveys, and the like. Among the accounts of dozens of botanists in the roster may be found brief notes on Thomas Antisell, C. C. Babington, John Ball, R. M. Barrington, Nathanial Colgan, Thomas Coulter, R. O. Cunningham, H. H. Dixon, G. C. Druce, Thomas Drummond, John Ellis,—to cull from the first five letters of the alphabet only! It is patent, then, that Praeger's book is a highly useful reference work. It is furthermore a delight to browse leisurely through its pages.

We lift one anecdote from Praeger's book for this review: Rev. William Spotswood Green, 1847–1919, aside from serving as rector of a "quiet country parish" and being an invertebrate zoologist of note, was the first to attain the summit of the highest of the New Zealand Alps, Mount Cook, ele. 12,349 feet, in 1881. Later Green surveyed for the Canadian Government in the Rockies of British Columbia and wrote *Among the Selkirk Glaciers* (1890). Praeger says "he was a man for whose energy, enterprise, courage and scientific imagination I had a sincere admiration; and I saw him at his best, at sea under difficult circumstances, during oceanic dredging and attempts to land on tempestuous Rockall. He was resourceful, and daring almost to rashness, as witness his adventures on Mount Cook in New Zealand; and his whimsical humour never forsook him. I recall him staggering down the companion ladder of the little 'Flying Falcon' in a full gale, and surveying the dishevelled cabin and his deep-sea dredging colleagues in a state of collapse. A sudden storm had come up; Green had spent the night with the captain on the bridge, in great pain on account of a heavy fall; and now, surveying the scene in the grey dawn, his only comment was: 'I have always thought that if the hippopotamus had been shown his photograph before he was created, he would have been able to suggest some important improvements.' That was Green all over."—Joseph Ewan, Tulane University.

[1] *Some Irish Naturalists. A Biographical Note-book.* By R. Lloyd Praeger, D.Sc., Sc.D., M.R.I.A. with 60 portraits. Dundalk, W. Tempest, Dundalgan Press, pp. 208. *18 plates, frontispiece.* 1949. 15s.

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